

1999 Annual Pavement Performance Report



Pavement Management System

This report was produced by the

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Division of Transportation Planning
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If you have questions or would like to request more
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PURPOSE



PURPOSE

This report provides information regarding the status of pavements on the State Highway System. The following pages present the current, past, and projected condition of Idaho's pavements based upon cracking, roughness, and rutting. This information was obtained from Idaho's Pavement Management System (PMS).

This report is comprised of the following sections:

- Executive Summary
- Pavement Management - System Overview
- General Information
- Pavement Condition
- Highway Needs
- Preventive Maintenance / Seal Coats
- Summary

EXECUTIVE SUMMARY

ACHIEVEMENTS

The Idaho Transportation Department has made significant progress toward reducing deficient pavements and giving motorists a safer and smoother ride. Pavement deficiencies on the State Highway System have been reduced from almost 40% in 1993 to an estimated 19% by the end of calendar year 1999. Reducing Pavement Deficiencies is a high priority for the department and has been accomplished by:

- The Transportation Board committing \$31 million annually toward pavement rehabilitation
- Utilizing the \$15.2 million Restricted Highway Fund to repair and maintain deficient highways
- Establishing department efficiency measures
- Consolidating programs and applying the cost savings to pavement-rehabilitation projects
- Partnering with the private sector allowing the department to stretch highway dollars
- Utilizing a successful maintenance / preventative maintenance program which slows the rate of pavement deterioration
- Improving the way we collect, analyze, and report pavement data

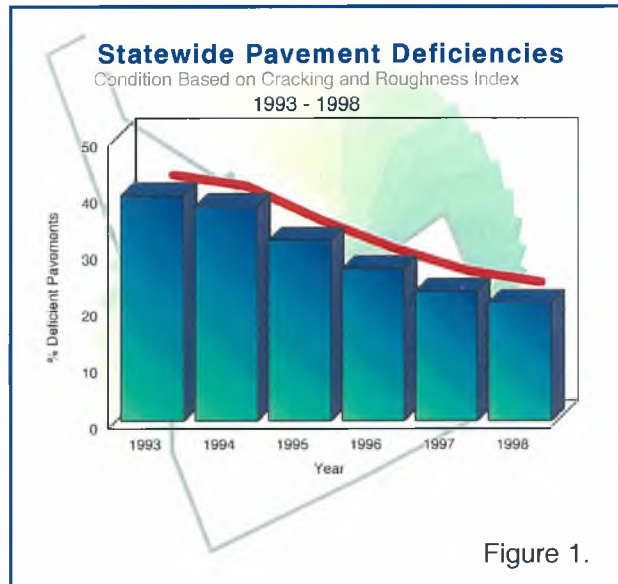


Figure 1.

NEEDS

Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do. Figure 2 below is a summary of current statewide needs by functional class. The estimated repair costs on the state highway system alone total nearly \$500 million and this is just one piece of the total transportation pie. Capacity, congestion, safety, and economic development all compete with pavement-improvement needs for limited funding.

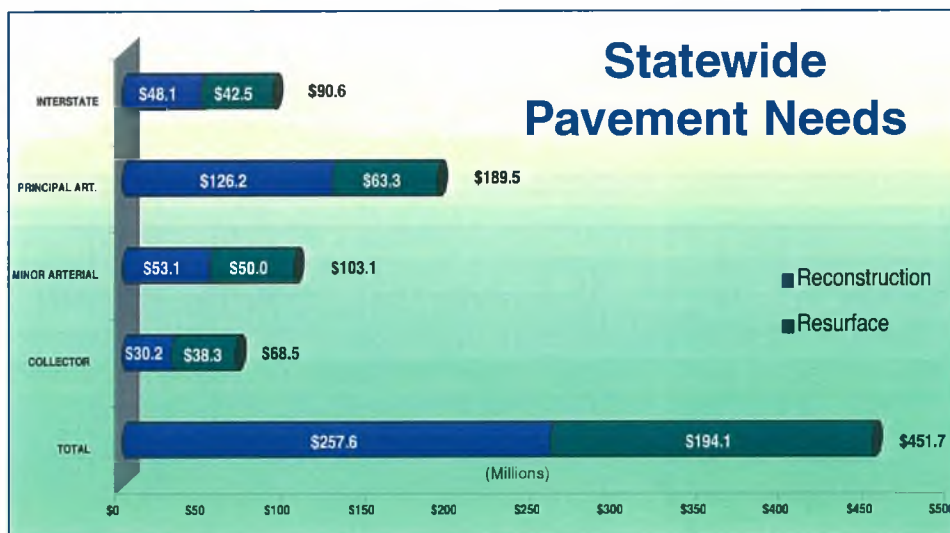


Figure 2.

Because Idaho's growing population and economy are likely to create a demand for more and heavier trucks, the department must continue its commitment to protect and maintain Idaho's investment in pavements on the State Highway System.

Section 1 PAVEMENT MANAGEMENT SYSTEM OVERVIEW



In 1977, the Idaho Transportation Department (ITD) began a review of existing pavement management programs with the goal of adopting one to fit Idaho's needs. The following year a Pavement Performance Management Information System (PPMIS) was acquired and made operational on ITD's mainframe computer. Since 1978, the PPMIS has been steadily improved and modified to meet conditions in Idaho. It has been tested and refined by ITD and consultant contract, the principal consultant being Pavement Management Systems Ltd., of Ontario, Canada. The last phase, economic analysis and optimization, was completed in July 1986.

Our Idaho State Highway System consists of approximately 5,000 centerline miles of paved highway, including 612 centerline

miles of Interstate. For network-level pavement management the system has been divided into about 1,800 sections varying in length from less than one mile to approximately ten miles.

Idaho's Pavement Management System covers both the network and project level. Network-level pavement management is performed by the Division of Transportation Planning while project-level pavement management is performed by ITD's Headquarters Materials Section. Pavement condition testing conducted at the network level is also split, with Materials overseeing skid testing while Planning Services collects roughness and rutting measurements. Planning Services is also responsible for surveying pavement distress (cracking), analyzing network PMS data, producing reports,

and developing and maintaining computer programs needed for pavement management. Deflection data for project-level pavement management is collected, analyzed, and reported by ITD's Materials Section.

PAVEMENT-CONDITION TESTING

Pavement-condition data is an important component of Idaho's PMS. Two-lane roads are tested in one direction while interstates and divided arterials are tested in both ascending and descending directions. Pavement-condition data elements are collected as follows:

- **Road Roughness** - Roughness is a primary indicator of pavement serviceability; or the ability of a pavement to meet the demands and expectations of motorists. In Idaho, the public's perception of the State Highway System is very important. For that reason, a Roughness Index (RI) was adopted that correlates the longitudinal profile of the road surface to an index based upon the public's perception of road roughness. The (RI) ranges from 0.0 to 5.0 (0.0 being extremely rough and 5.0 being perfectly smooth).

A South-Dakota-type Profilometer is currently used by ITD to obtain pavement roughness. This instrument uses laser sensors and a personal computer to collect and store road-profile information. The vehicle stores profile and rutting measurements at one-foot intervals traveling at highway speeds, and is mounted in a van operated by the Planning Services Section. Longitudinal profiles of all pavement-management sections statewide are obtained annually.

- **Pavement Distress (Cracking)** -

Pavement distress, or cracking, is another important indicator of pavement condition. The video-inspection vehicle used to collect profile information also collects pavement video on the entire State Highway System each year. The Pavement Management Engineer then uses this video to determine the type, extent, and severity of cracking within each PMS section. Based on this input a Crack Index (CI) is calculated by the computer for each section. The CI is a rating very similar to the RI with 5.0 corresponding to a section with little or no cracking and 0.0 representing a section with severe cracking.

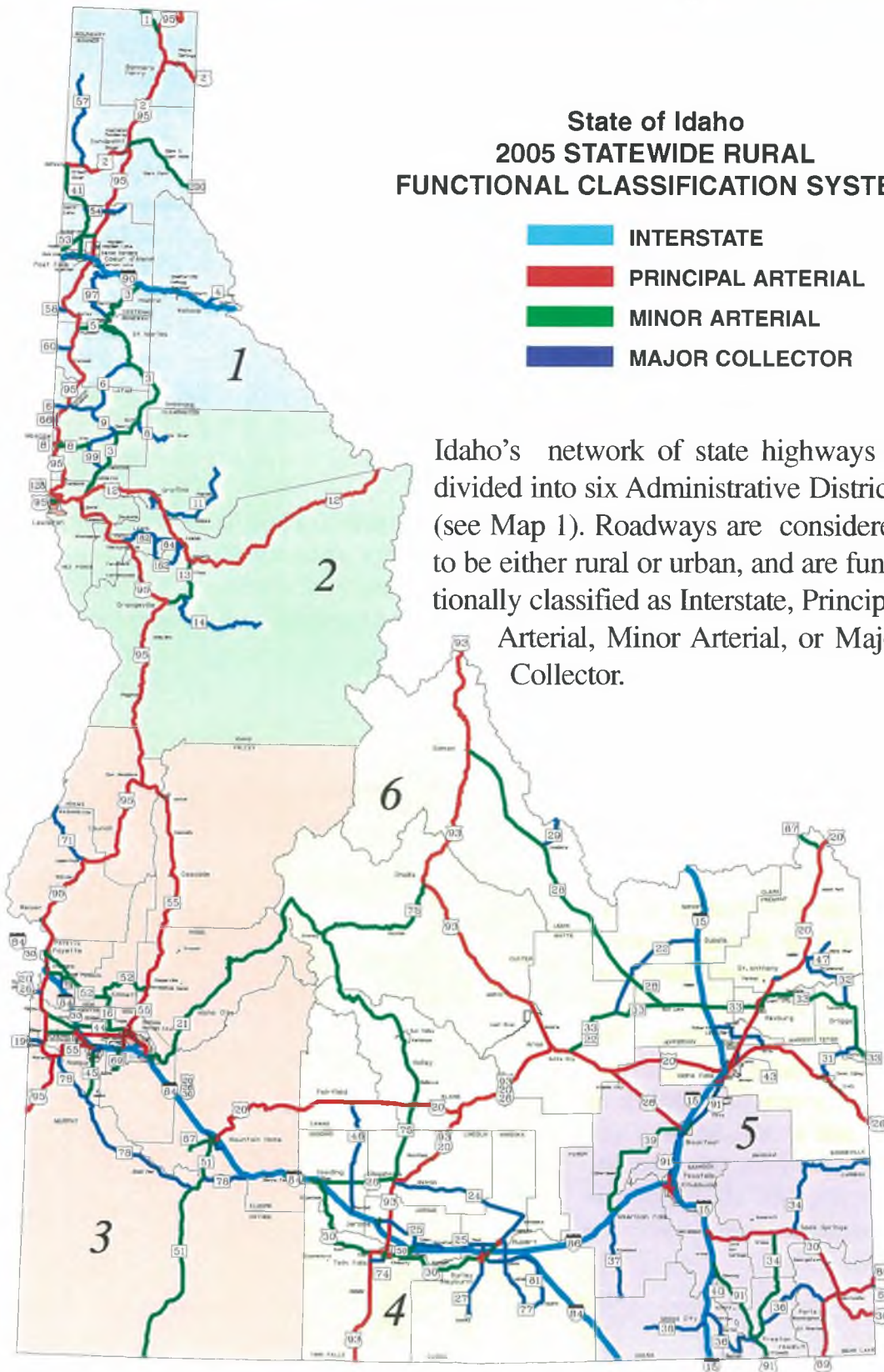
- **Final Index** - A Final Index (FI), which is the average of RI and CI, is used as a single indicator of Pavement Condition in many PMS reports.

Section 2 GENERAL INFORMATION

State of Idaho 2005 STATEWIDE RURAL FUNCTIONAL CLASSIFICATION SYSTEM

- INTERSTATE
- PRINCIPAL ARTERIAL
- MINOR ARTERIAL
- MAJOR COLLECTOR

Idaho's network of state highways is divided into six Administrative Districts (see Map 1). Roadways are considered to be either rural or urban, and are functionally classified as Interstate, Principal Arterial, Minor Arterial, or Major Collector.



Map 1

1998 CENTERLINE MILES BY DISTRICT

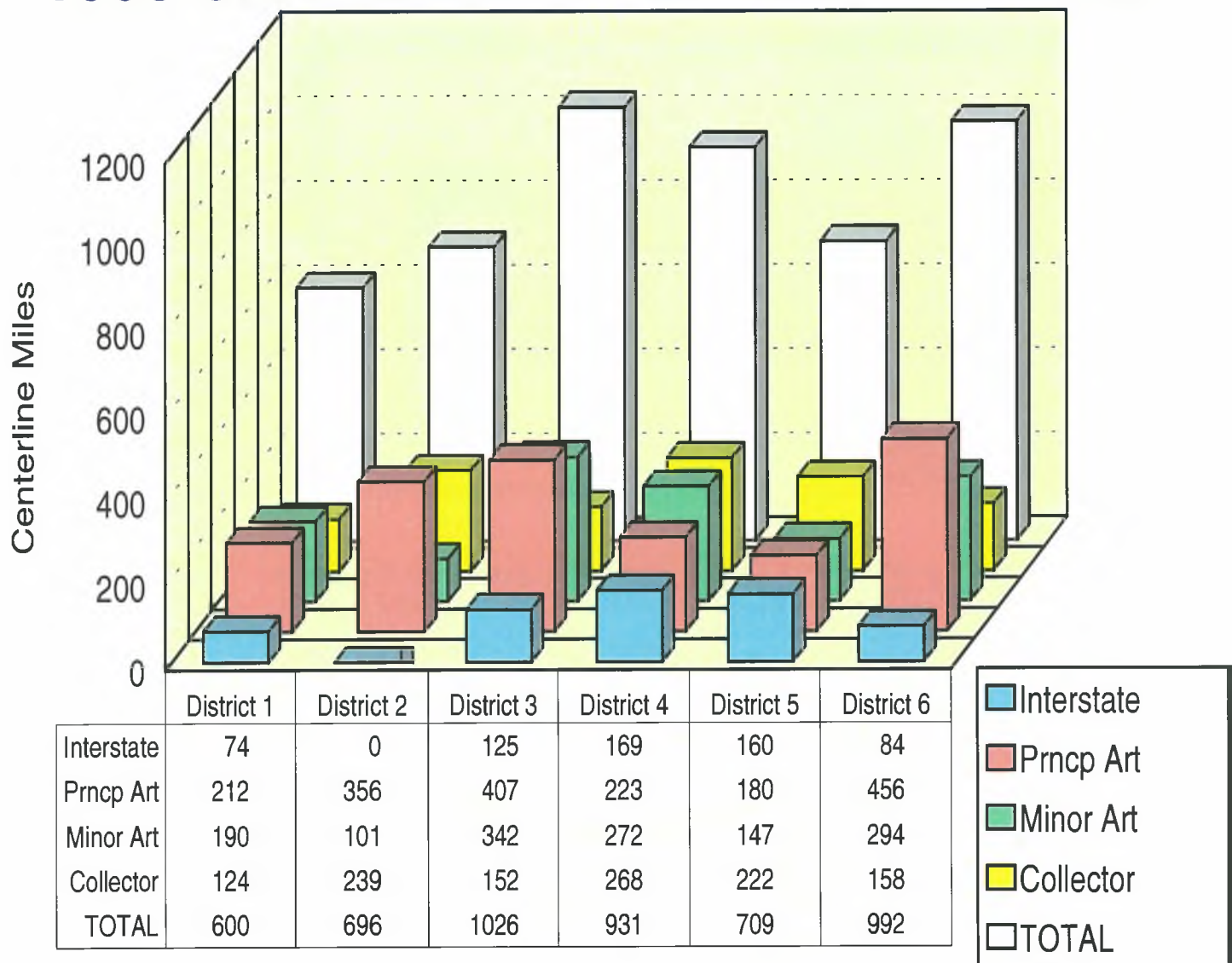


Figure 3.

Centerline mileage, by district and functional class, is shown in Figures 3, 4, and 5. There are 4,955 centerline miles on the state highway system. District 3 is the largest district with 1,026 centerline miles (20.7% of total statewide miles) and District 1 is the smallest of the six districts with 600 centerline miles (12.1% of total mileage).

1998 STATEWIDE CENTERLINE MILES By Functional Class

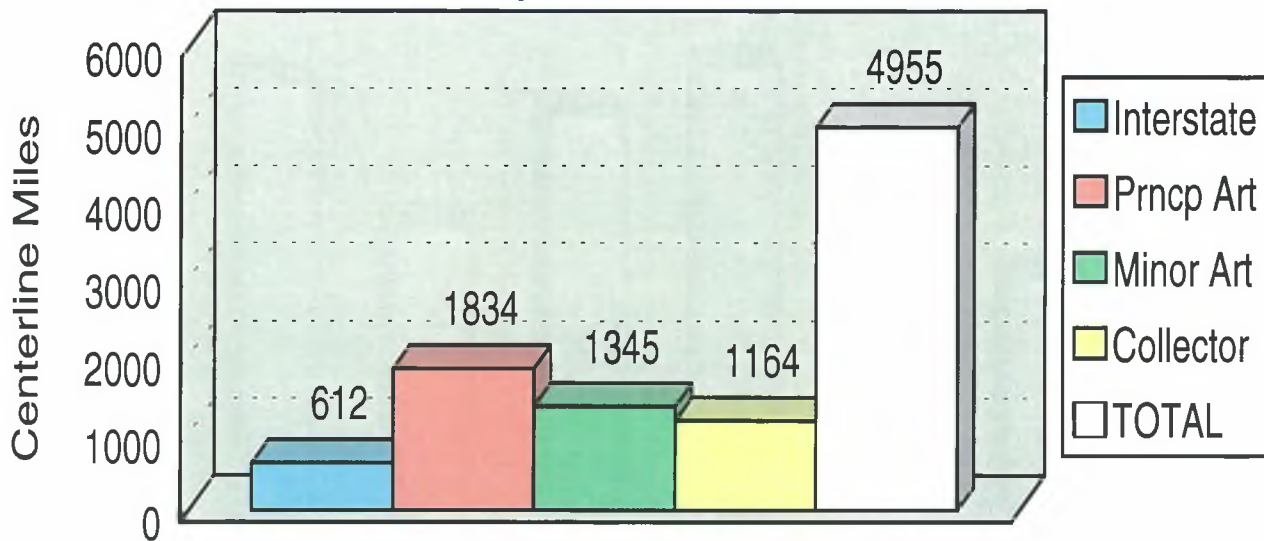


Figure 4.

1998 CENTERLINE MILES BY DISTRICT

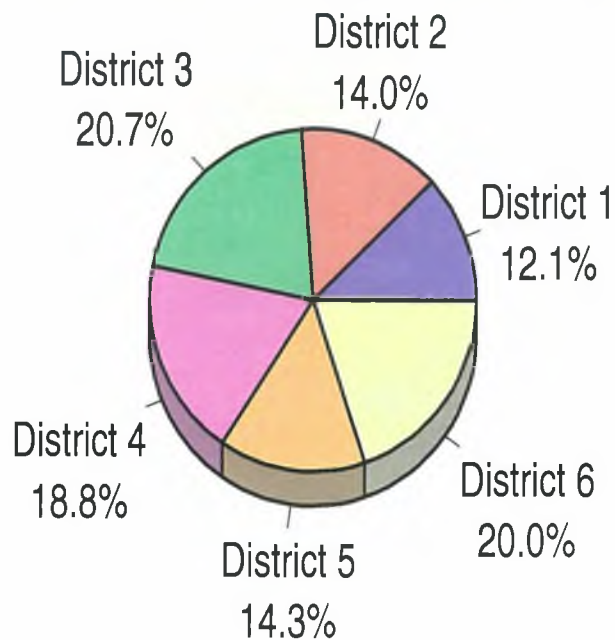


Figure 5.

1998 LANE MILES BY DISTRICT

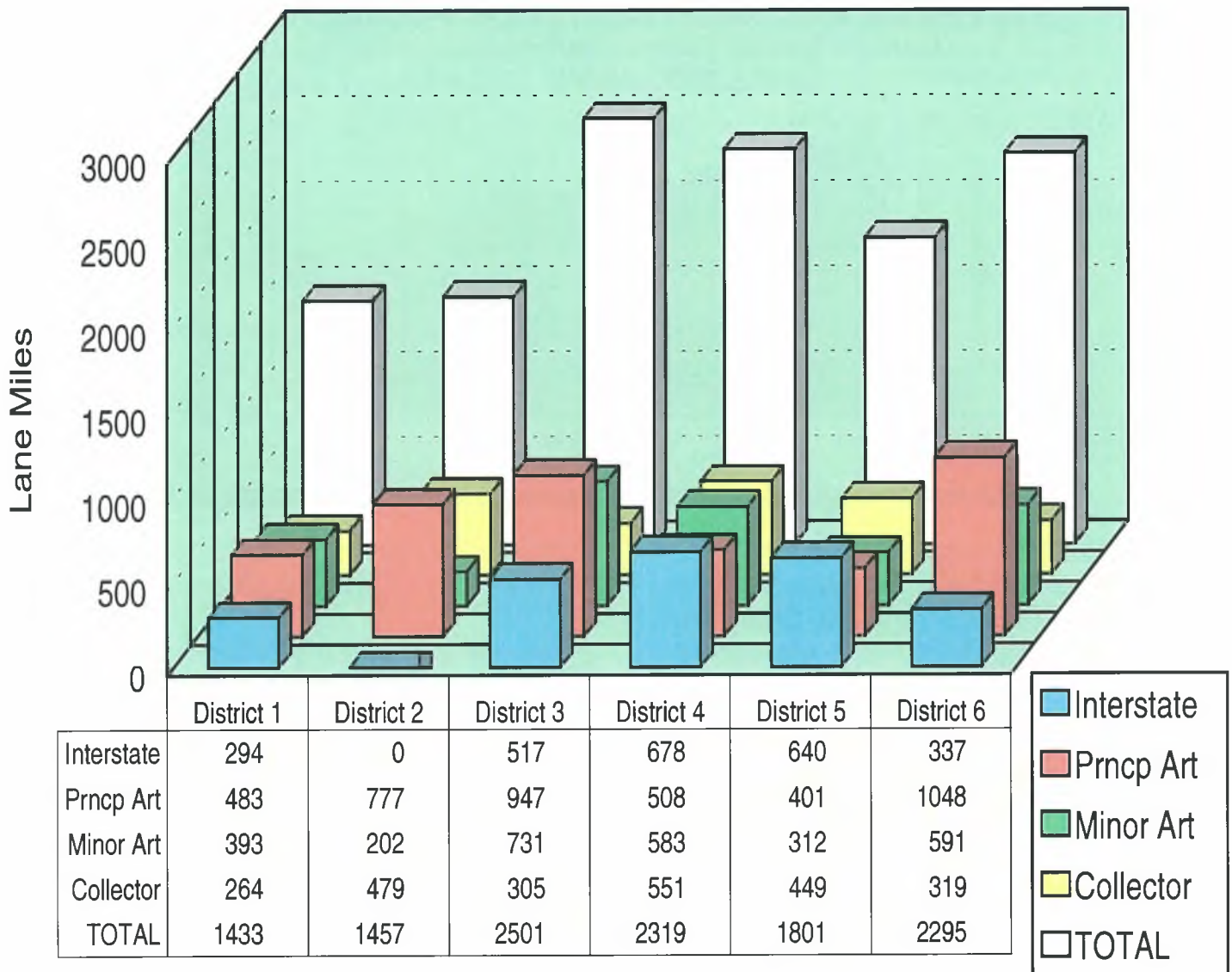
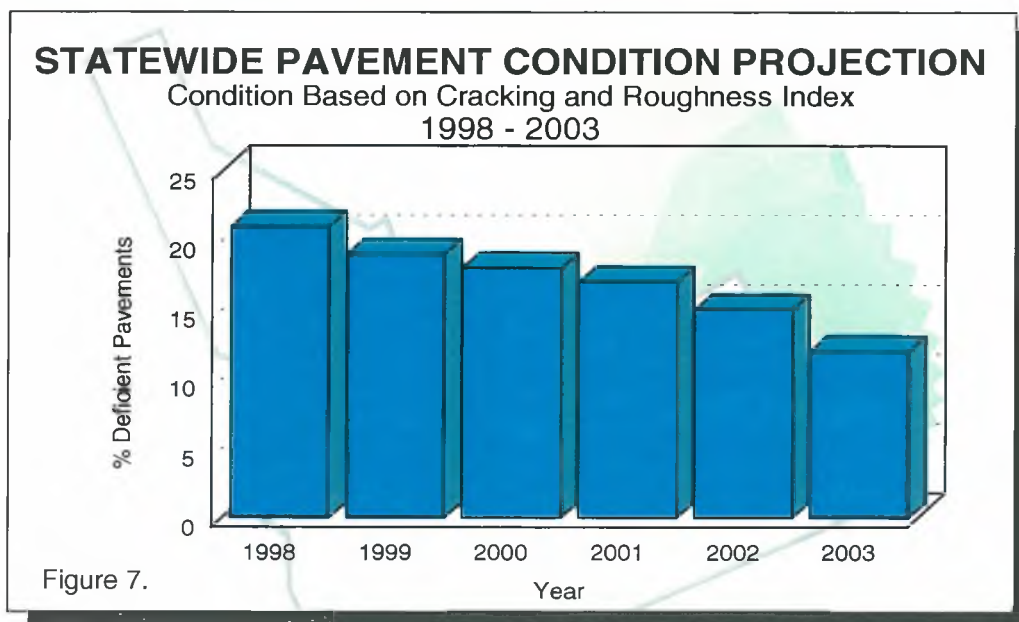


Figure 6.

Figure 6 is a summary of lane miles by functional class. Lane miles are calculated by multiplying centerline miles by the number of through lanes. Idaho has approximately 11,800 lane miles on the State Highway System.

Section 3 PAVEMENT CONDITION



PAVEMENT CONDITION

Pavement Condition is dependant upon functional classification and is divided into two categories: (1) interstates and arterials, (2) collectors.

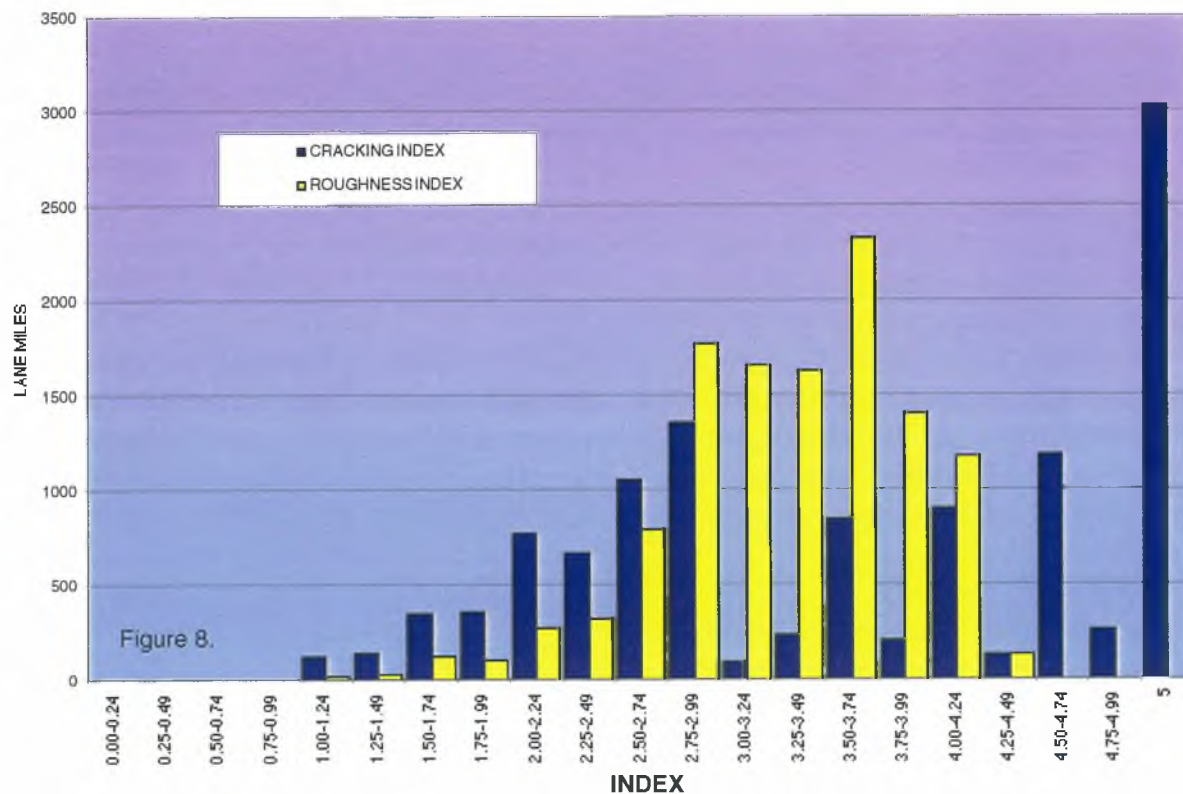
- Pavements on interstates, arterials, and collectors are classified as good if the lower of the Cracking Index (CI) or Roughness Index (RI) is greater than 3.0;
- Pavements are fair if the lower of CI or RI is between 2.5 and 3.0 (2.0 to 3.0 for collectors);

- Poor pavements exhibit indices between 2.0 and 2.5 (1.5 to 2.0 on collectors);
- Interstate and arterial pavements considered to be very poor are those with the lower of the two indices falling below 2.0, or a CI or RI rating below 1.5 for collectors.

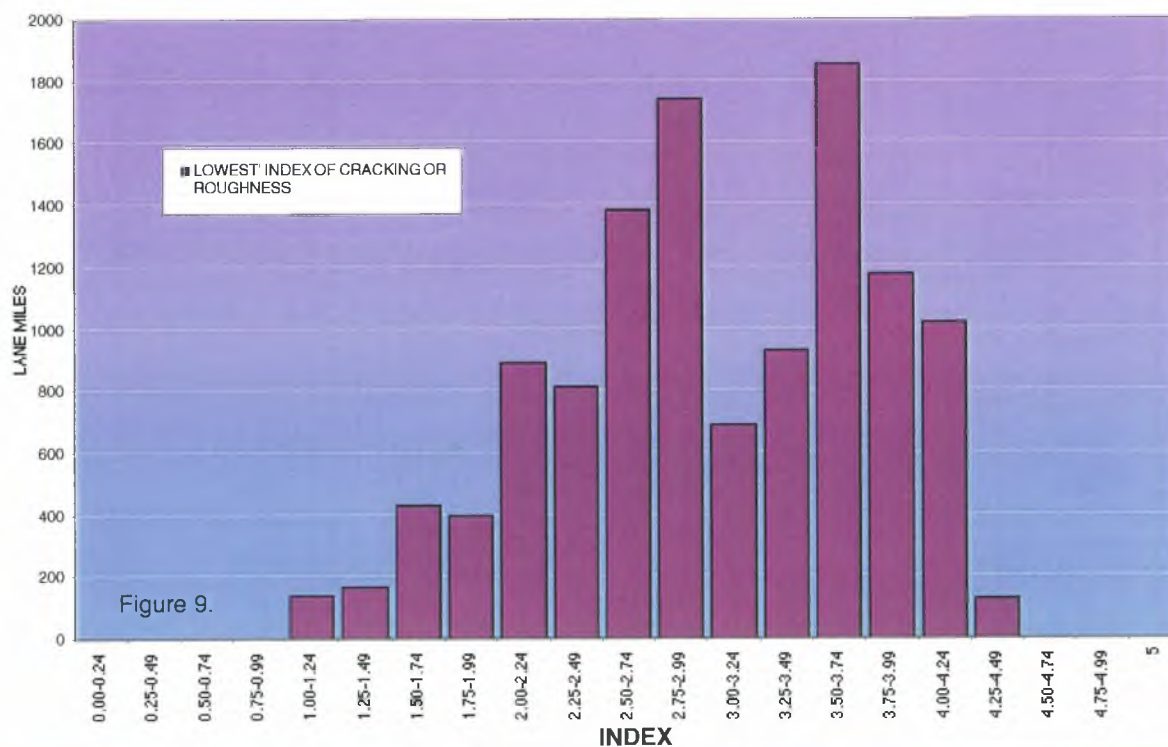
The current statewide distribution of good, fair, poor, and very poor pavements, based upon roughness and cracking, is shown on page 10 in Figures 8 and 9.

Pavement Condition	Interstates and Arterials	Collectors
	Lower Index: Cracking (CI) or Roughness (RI)	
Good	$(CI \text{ or } RI) > 3.0$	$(CI \text{ or } RI) > 3.0$
Fair	$2.5 \leq (CI \text{ or } RI) \leq 3.0$	$2.0 \leq (CI \text{ or } RI) \leq 3.0$
Poor	$2.0 \leq (CI \text{ or } RI) < 2.5$	$1.5 \leq (CI \text{ or } RI) < 2.0$
Very Poor	$(CI \text{ or } RI) < 2.0$	$(CI \text{ or } RI) < 1.5$

Distribution of Cracking and Roughness Indices



Distribution of Lowest Index (Cracking or Roughness)



PAVEMENT CONDITION (continued)

Figures 10 and 11 summarize pavement conditions from 1994 through 1999 (1999 is projected). This summary indicates that pavements considered good statewide have risen from a low of about 18.7% in 1994 to approximately 51% projected for 1999. The percent of fair pavements has declined from approximately 44% in 1994 to 30% projected for 1999. Pavements considered poor or very poor have declined from a maximum of almost 38% in 1994 to approximately 19% projected for 1999.

Figure 12 is a summary of current pavement condition on the State Highway System in terms of percent "good", "fair," "poor," and "very poor."

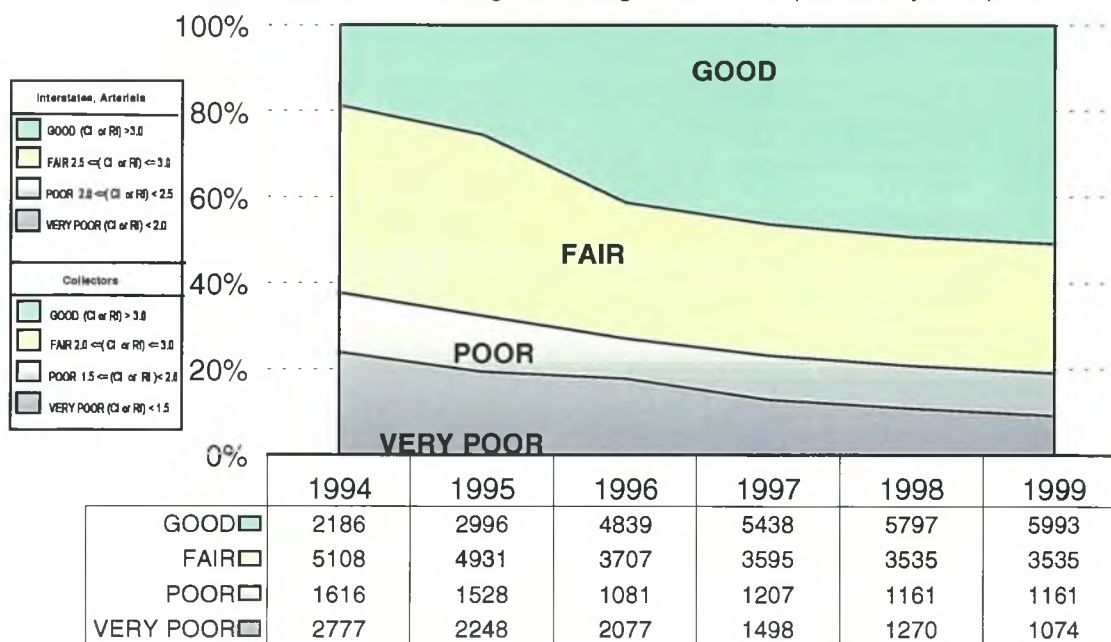
Current pavement condition by district is shown in Figure 13. The percentages in Figure 13 are based on statewide lane miles. For example, 9.6% of all pavements statewide considered good, and 15.3% of all pavements considered very poor are located in District 1.

Figure 14 is also a summary of pavement condition based on total lane miles in each district, as opposed to statewide mileage. For example: 13.6% of District 1 roadways are considered very poor; and 56.6% of District 5 roadways are considered good.

STATEWIDE PAVEMENT CONDITION

By Lane Miles

Condition Based on Cracking and Roughness Index (1999 Projected)



Note: Poor / Very Poor are considered deficient
Mileage does not include unpaved state highways

Figure 10.

DISTRICT PAVEMENT CONDITION

By Lane Miles

Condition Based on Cracking and Roughness Index (1999 Projected)

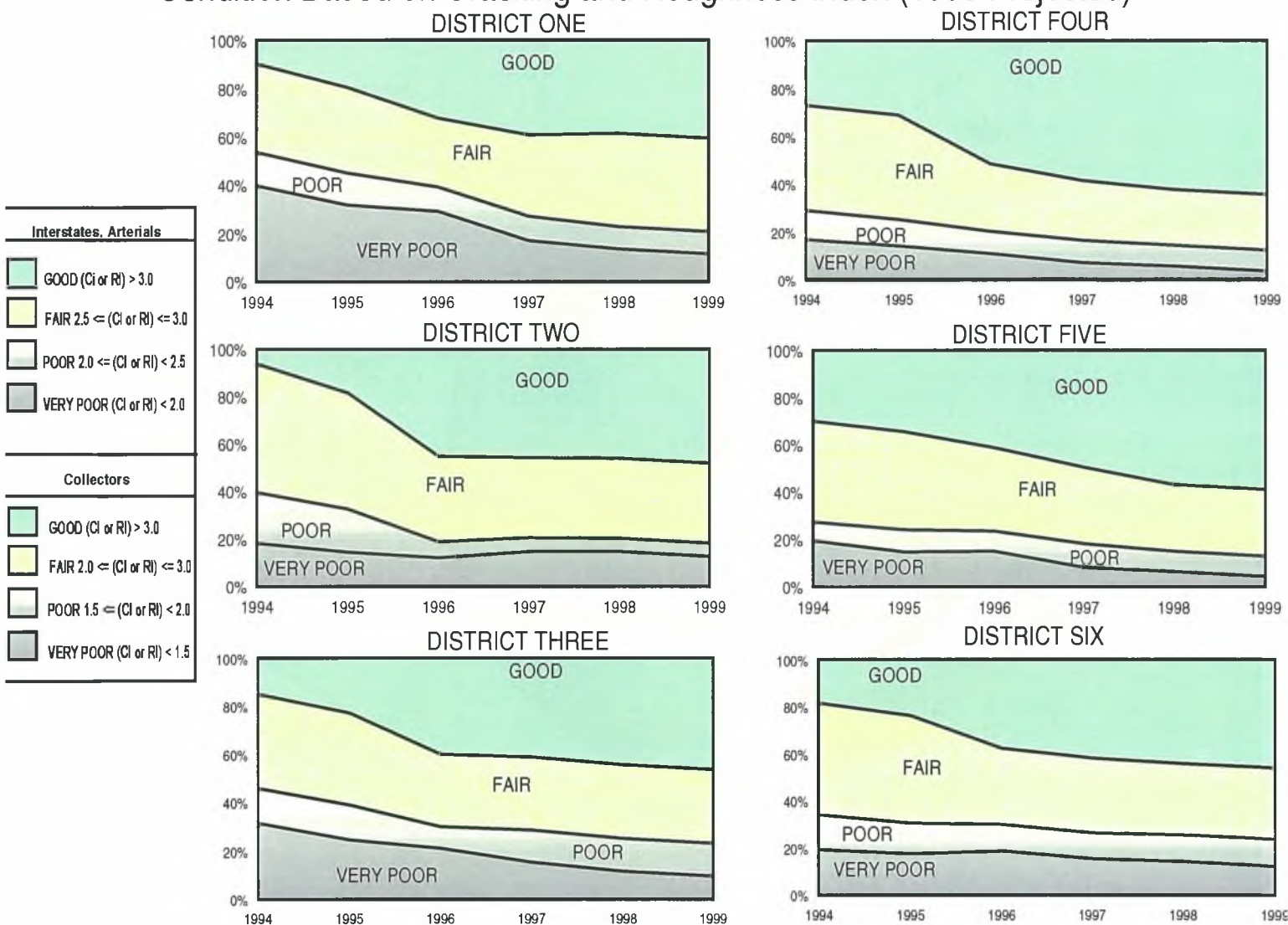


Figure 11.

STATEWIDE PAVEMENT CONDITION

Condition Based on Cracking and Roughness Index

1998

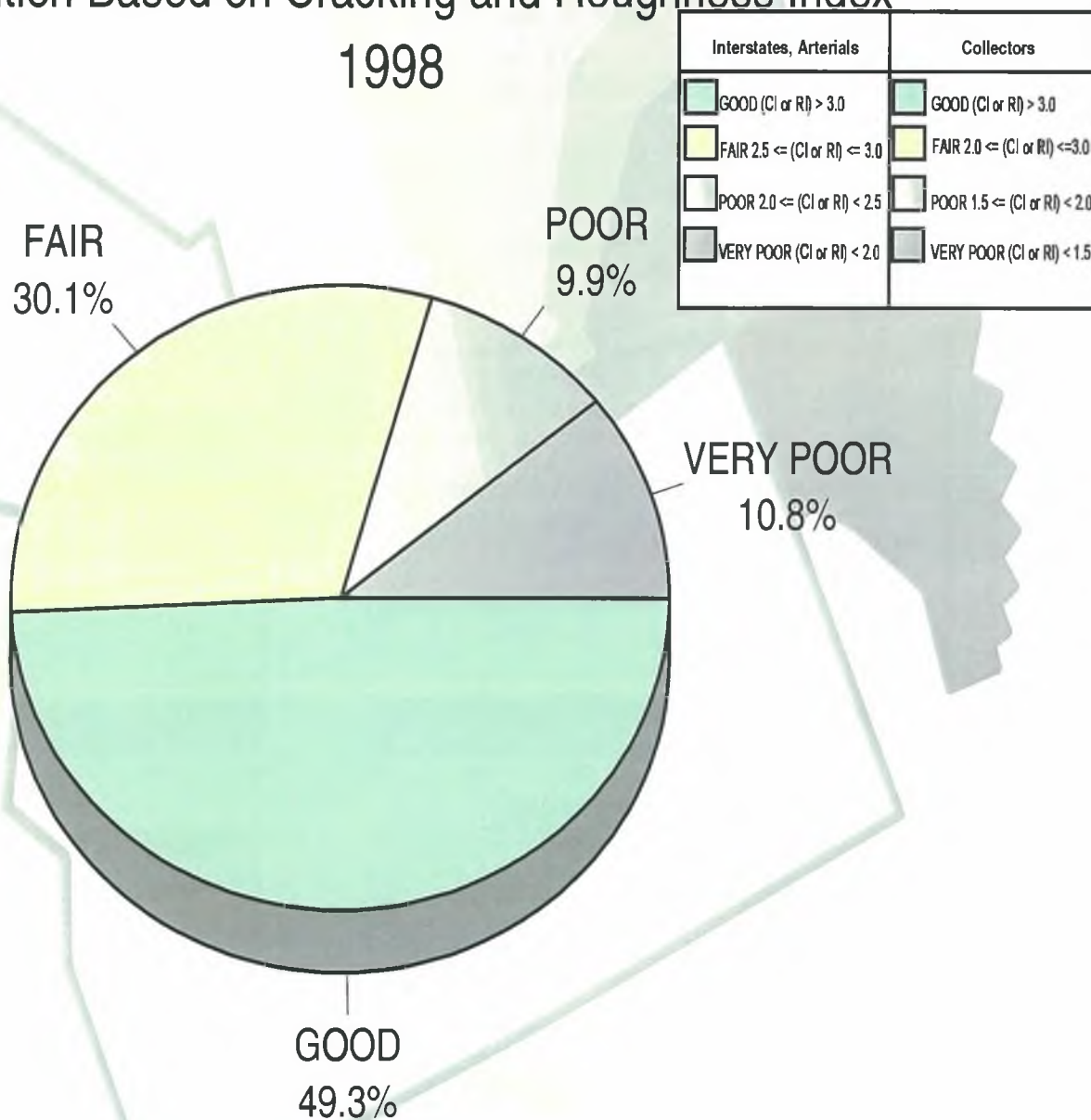


Figure 12.

DISTRICT PAVEMENT CONDITION

Based on Statewide Percentages
Condition Based on Cracking and Roughness Index

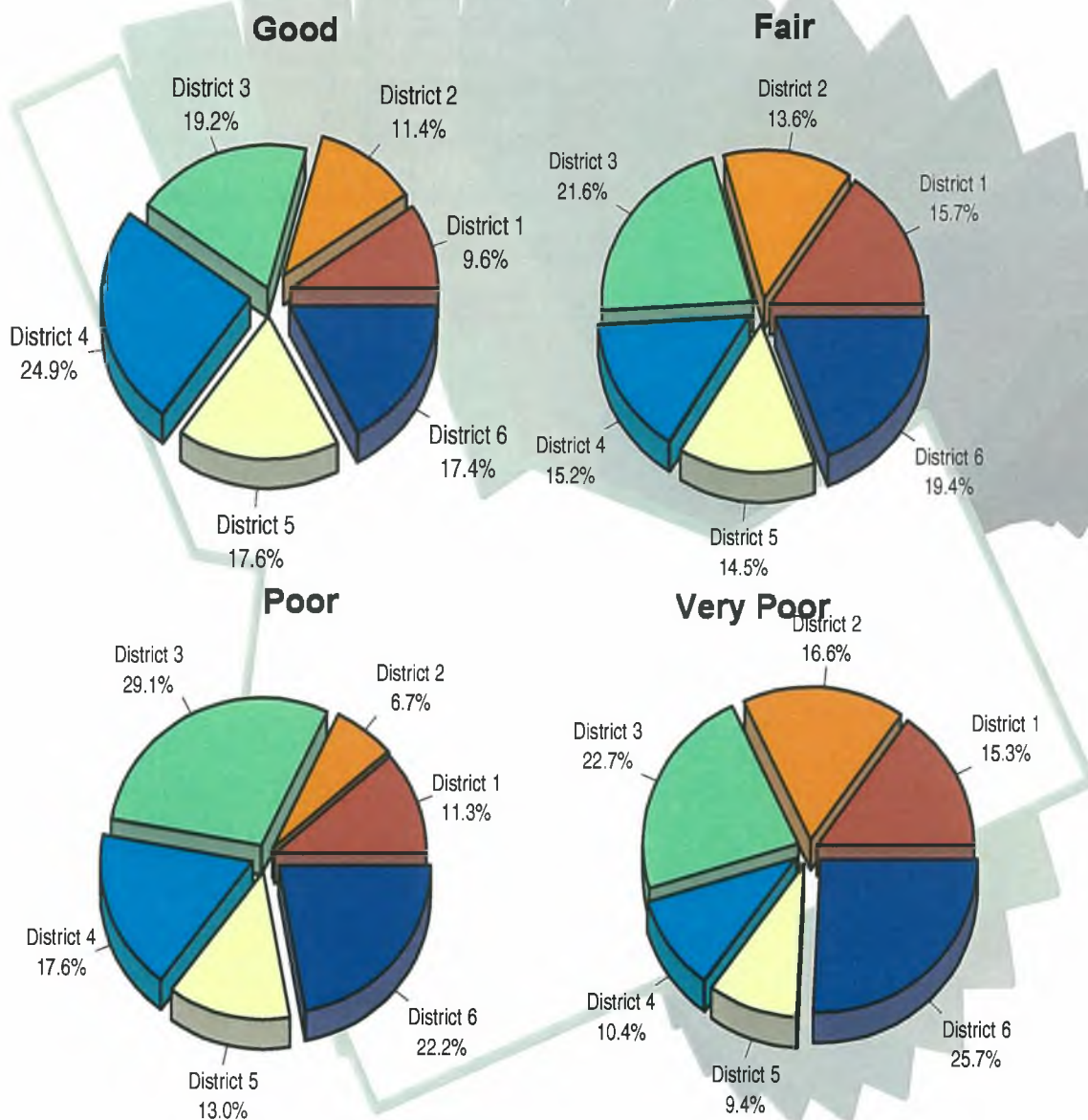


Figure 13.

DISTRICT PAVEMENT CONDITION

Condition Based on Cracking and Roughness Index

1998

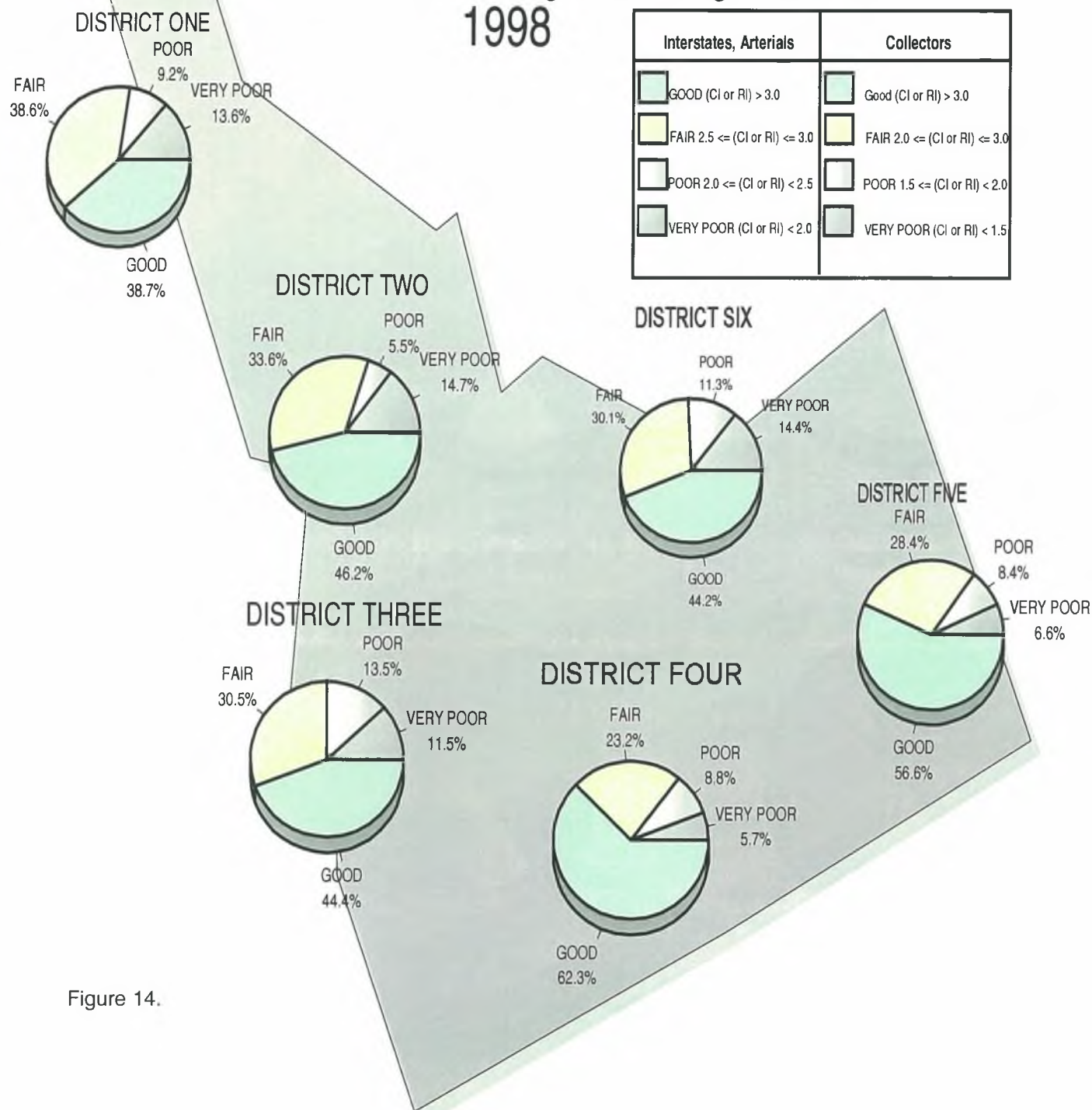
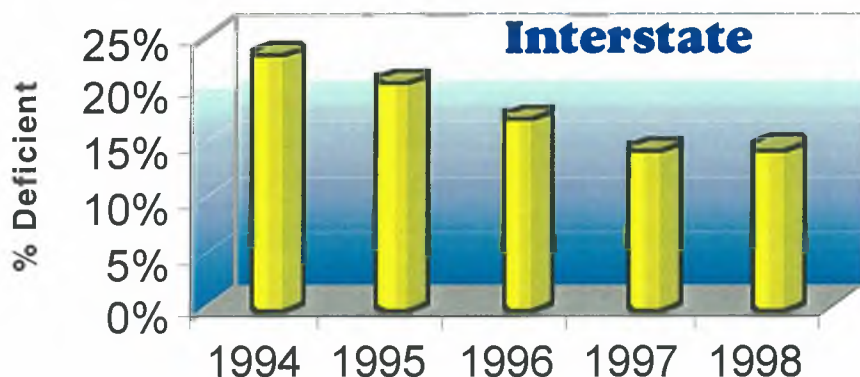


Figure 14.

PAVEMENT DEFICIENCIES BY SYSTEM

The following graphs represent a summary of Idaho's five-year pavement performance on interstates, remaining National Highway System (NHS), and Non National Highway System (Non-NHS) routes.



Interstate highways in Idaho have improved from 23 percent deficient in 1994 to 15 percent deficient in 1998, a reduction of 8% in four years.

Figure 15.

The remaining (Non-Interstate) NHS routes have improved from 38 percent deficient in 1994 to approximately 20 percent deficient in 1998, a reduction of 18% in four years.

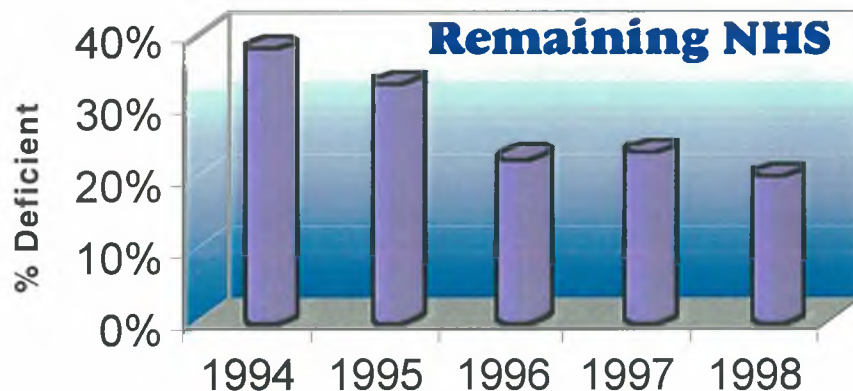
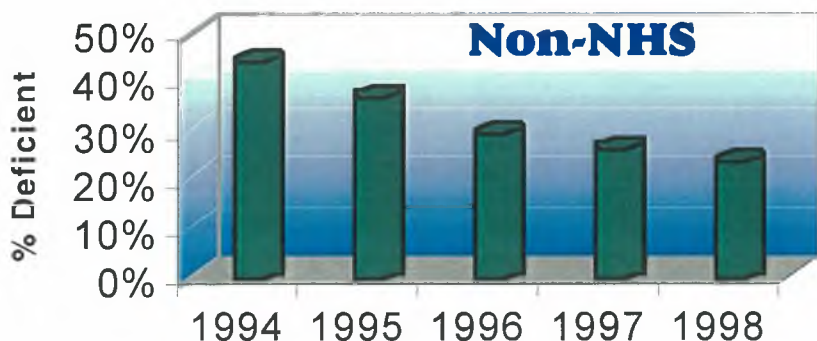


Figure 16.



Non-NHS route deficiencies have also been reduced from over 44% in 1994 to 24% in 1998, a reduction of 20% in four years.

Figure 17.

State of Idaho

Pavement Condition Map

(11,763 Lane Miles)

			
Good	Fair	Poor	Very Poor
(5,797 Lane Miles)	(3,535 Lane Miles)	(1,161 Lane Miles)	(1,270 Lane Miles)

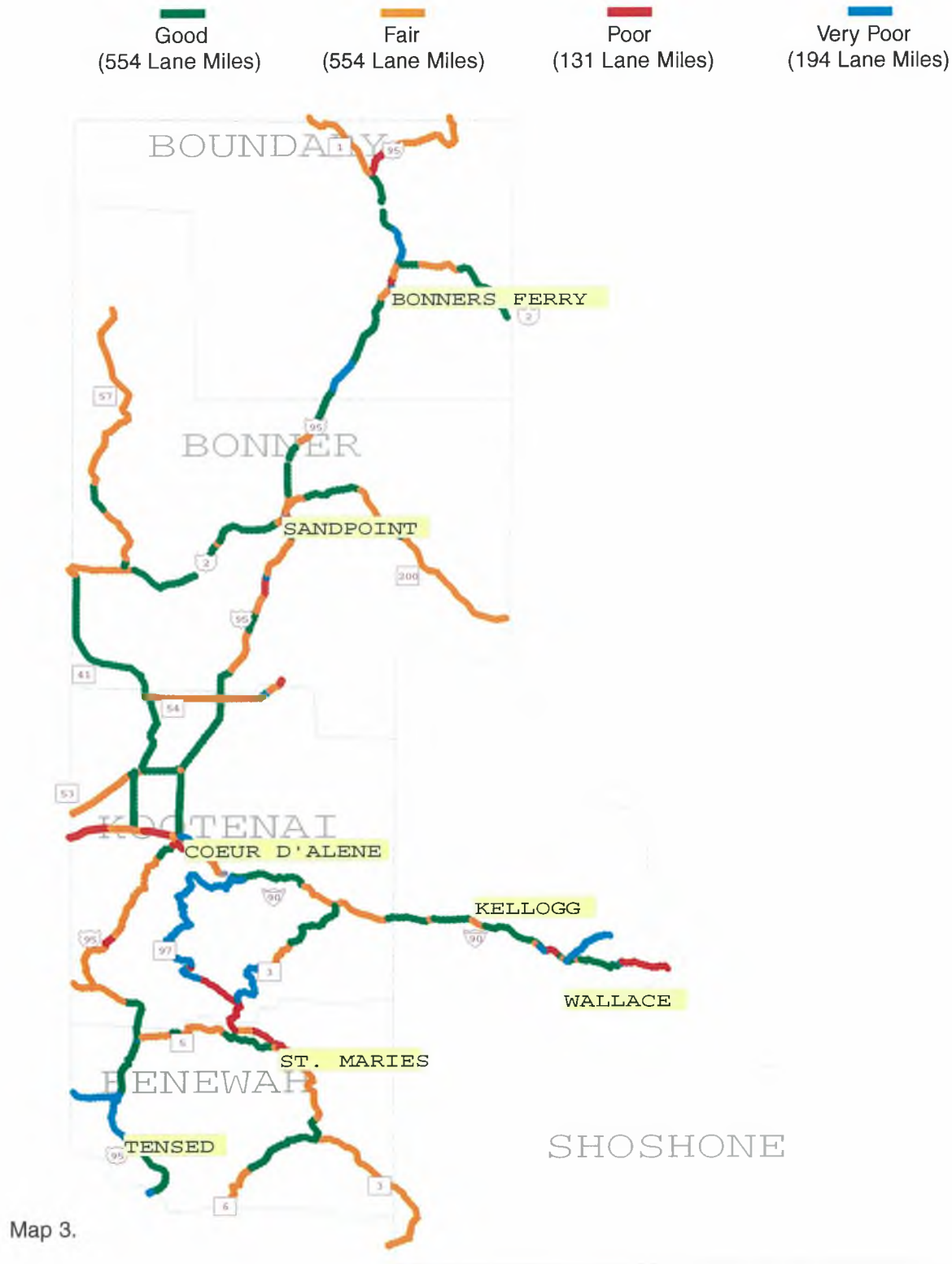


Map 2.

District 1

Pavement Condition Map

(1,433 lane miles)



District 2

Pavement Condition Map

(1,433 lane miles)

			
Good	Fair	Poor	Very Poor
(662 Lane Miles)	(482 Lane Miles)	(78 Lane Miles)	(211 Lane Miles)







Map 4.

District 3

Pavement Condition Map

(2,501 lane miles)

			
Good	Fair	Poor	Very Poor
(1,111 Lane Miles)	(764 Lane Miles)	(338 Lane Miles)	(288 Lane Miles)







Map 5.

District 4

Pavement Condition Map

(2,319 lane miles)

			
Good	Fair	Poor	Very Poor
(1,444 Lane Miles)	(539 Lane Miles)	(204 Lane Miles)	(132 Lane Miles)







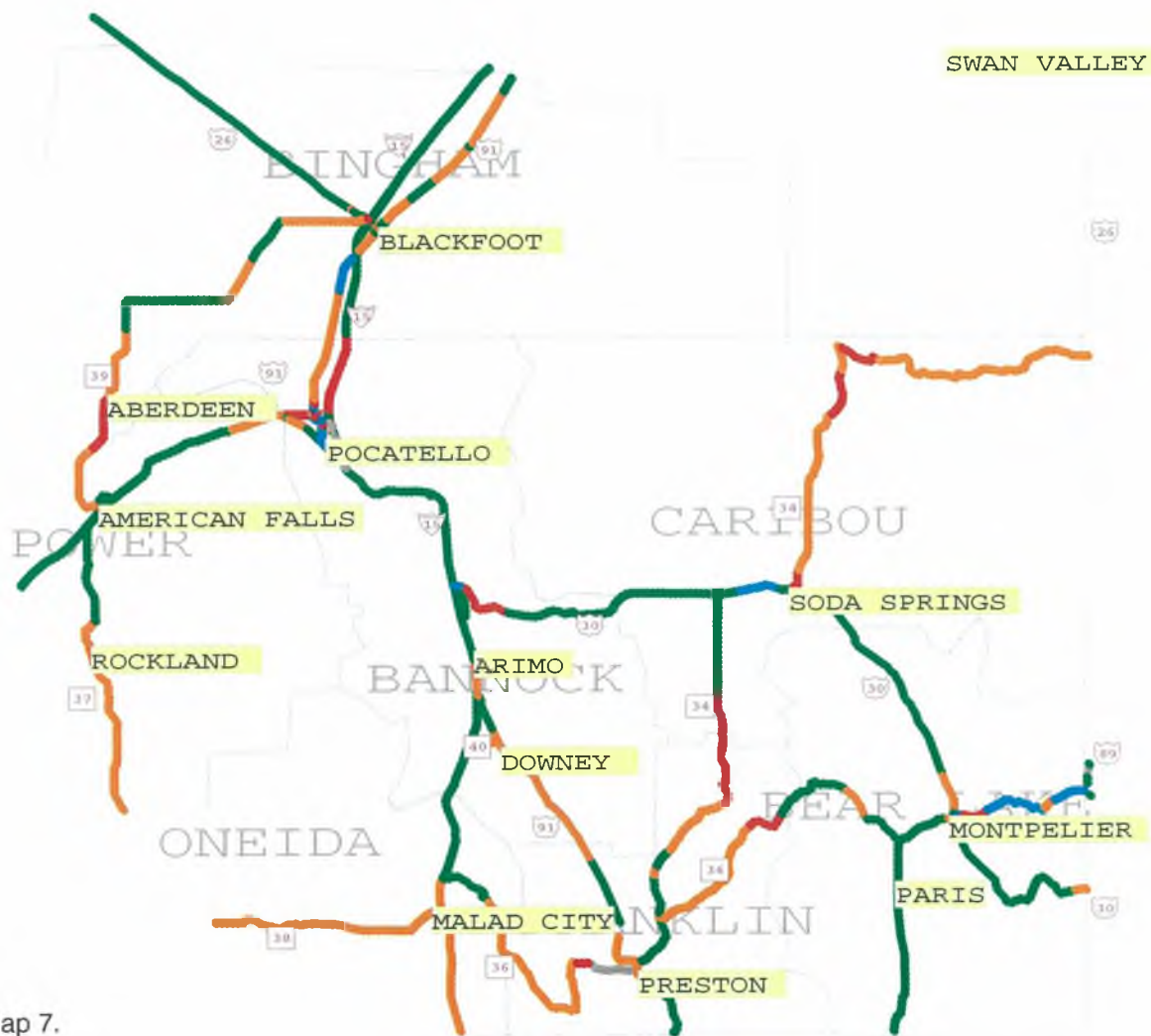
Map 6.

District 5

Pavement Condition Map

(1,801 lane miles)

			
Good	Fair	Poor	Very Poor
(1,020 Lane Miles)	(511 Lane Miles)	(151 Lane Miles)	(120 Lane Miles)







Map 7.

District 6

Pavement Condition Map

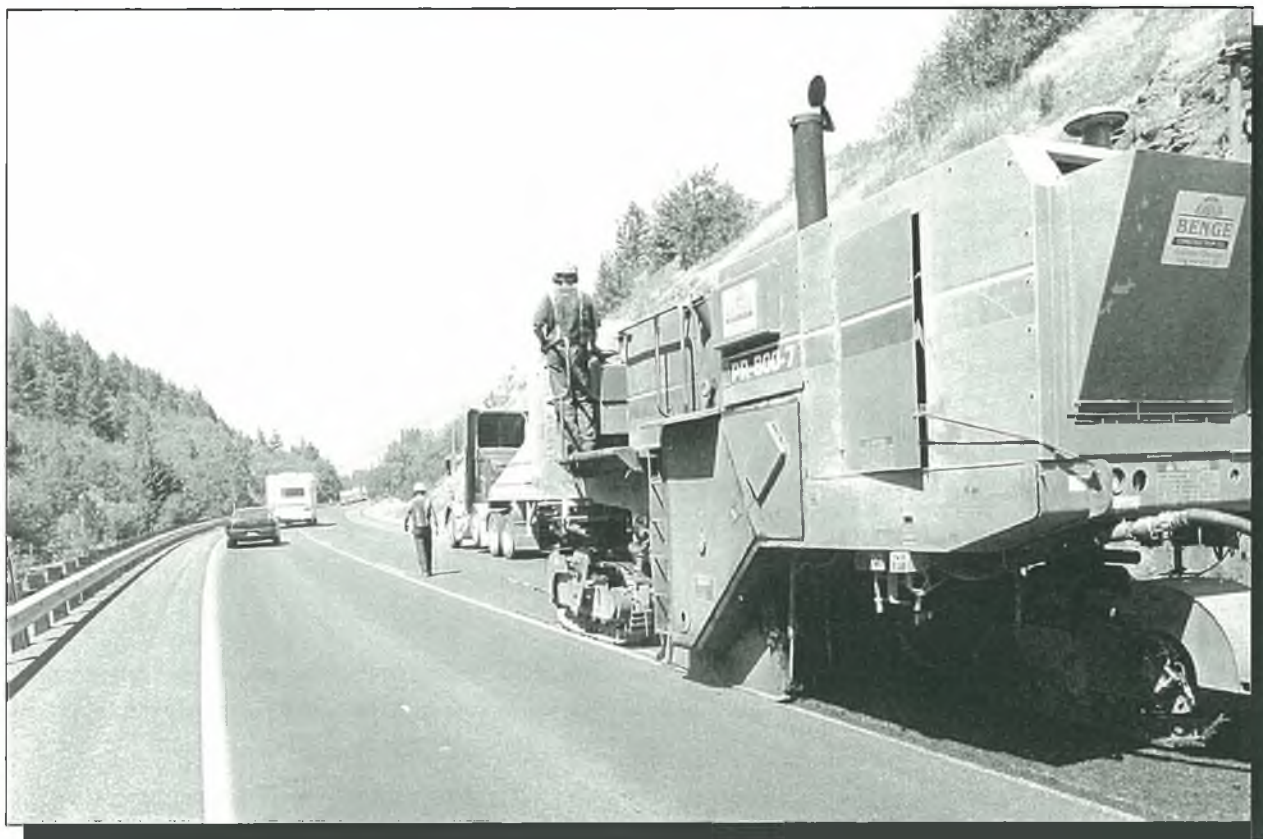
(2,277 lane miles)

			
Good	Fair	Poor	Very Poor
(1,006 Lane Miles)	(686 Lane Miles)	(258 Lane Miles)	(327 Lane Miles)



Map 8.

Section 4 NEEDS ANALYSIS



PAVEMENT NEEDS

The pavement-condition needs identified on the following pages were obtained through the Highway Performance Monitoring System - Analytical Package (HPMS-A/P).

The HPMS-A/P is a model developed by the Federal Highway Administration (FHWA) to analyze data furnished to them by the states. The results of the analysis are used by the FHWA in policy development and for their bi-annual reports to Congress on the status and performance of the Nation's Highways. This model has been adapted in-house and by consultant contract for ITD's use so that we may apply the same types of analysis to Idaho's pavement-management data.

The A/P's function is to analyze highway inventory data and to develop relationships

between various levels of capital investment, and the resulting condition of the State Highway System. It is a tool to help management predict the effects of any proposed level of capital investment and the corresponding condition, safety, and service characteristics of the highway system. It responds to a variety of questions regarding the levels of investment necessary to accomplish desired objectives.

The Planning Services Section has enhanced the program by modifying it to reflect:

- Idaho's costs (based on ITD project history files)
- The department's design standards
- Our minimum tolerable conditions

(continues on next page)

PAVEMENT NEEDS (continued)

The analytical package analyzes data related to:

- pavement condition,
- geometrics,
- roadway cross section,
- operation, and
- access control.

Among its many reports, the program produces a prioritized list of pavement-management sections, year of need, and the type and cost of rehabilitation.

Figure 18 is a graphical representation of needs by district.

The table on page 27 is a summary of current pavement needs by district and functional class. Deficiencies are defined as very poor and poor pavements (based on roughness and cracking).

Pavement needs are further classified as either resurface or reconstruction depending on the level and type of deficiency identified for individual pavement sections. Costs are based on the average project costs for Idaho over the last ten years.

The district maps on pages 28 through 33 identify the specific locations of pavement deficiencies and programmed highway projects in each district.



Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do.

1998 PAVEMENT CONDITION NEEDS

By Lane Miles

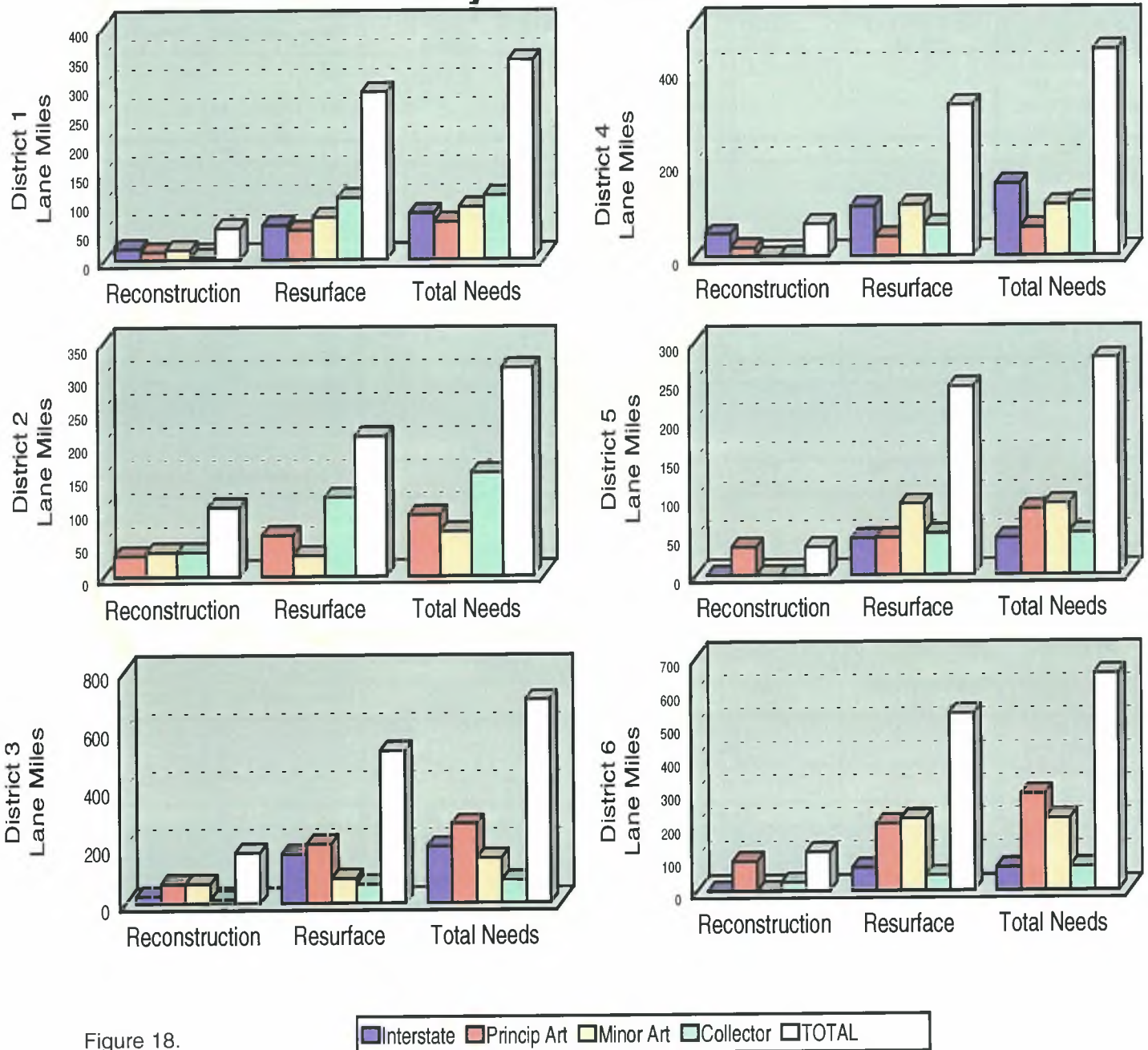


Figure 18.

1998 Pavement Condition Needs (State System)

DISTRICT 1						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	20	11,101	59	6,560	79	17,661
PRINCIPAL ART.	13	6,786	51	4,631	64	11,417
MINOR ARTERIAL	18	7,663	73	7,344	90	15,007
COLLECTOR	3	1,407	106	11,059	110	12,466
TOTAL	54	26,957	288	29,594	342	56,551
DISTRICT 2						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	-	-	-	-
PRINCIPAL ART.	30	17,751	61	7,683	92	25,434
MINOR ARTERIAL	36	18,822	31	2,730	67	21,552
COLLECTOR	36	14,029	118	10,156	155	24,185
TOTAL	103	50,602	210	20,569	313	71,171
DISTRICT 3						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	27	13,816	169	15,461	196	29,277
PRINCIPAL ART.	67	31,515	206	22,537	273	54,052
MINOR ARTERIAL	69	26,597	85	8,841	154	35,438
COLLECTOR	13	3,265	65	4,502	77	7,767
TOTAL	176	75,193	525	51,341	701	126,534
DISTRICT 4						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	49	23,208	106	9,570	155	32,778
PRINCIPAL ART.	19	8,263	41	4,730	60	12,993
MINOR ARTERIAL	-	-	110	9,208	110	9,208
COLLECTOR	2	516	67	4,590	118	5,106
TOTAL	70	31,987	324	28,098	443	60,085
DISTRICT 5						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	48	4,566	48	4,566
PRINCIPAL ART.	36	18,764	49	6,123	85	24,887
MINOR ARTERIAL	-	-	92	6,685	92	6,685
COLLECTOR	-	-	54	4,357	54	4,357
TOTAL	36	18,764	243	21,731	279	40,495
DISTRICT 6						
	RECONSTRUCTION		RESURFACE		TOTAL LANE MILES	TOTAL COST (\$000)
	DEFICIENT LANE MILES	COST (\$000)	DEFICIENT LANE MILES	COST (\$000)		
INTERSTATE	-	-	71	6,330	71	6,330
PRINCIPAL ART.	90	43,145	201	17,603	291	60,748
MINOR ARTERIAL	-	-	216	15,194	216	15,194
COLLECTOR	28	10,985	45	3,647	73	14,632
TOTAL	118	54,130	533	42,774	650	96,904
GRAND TOTAL	556	257,633	2,123	194,107	2,729	451,740

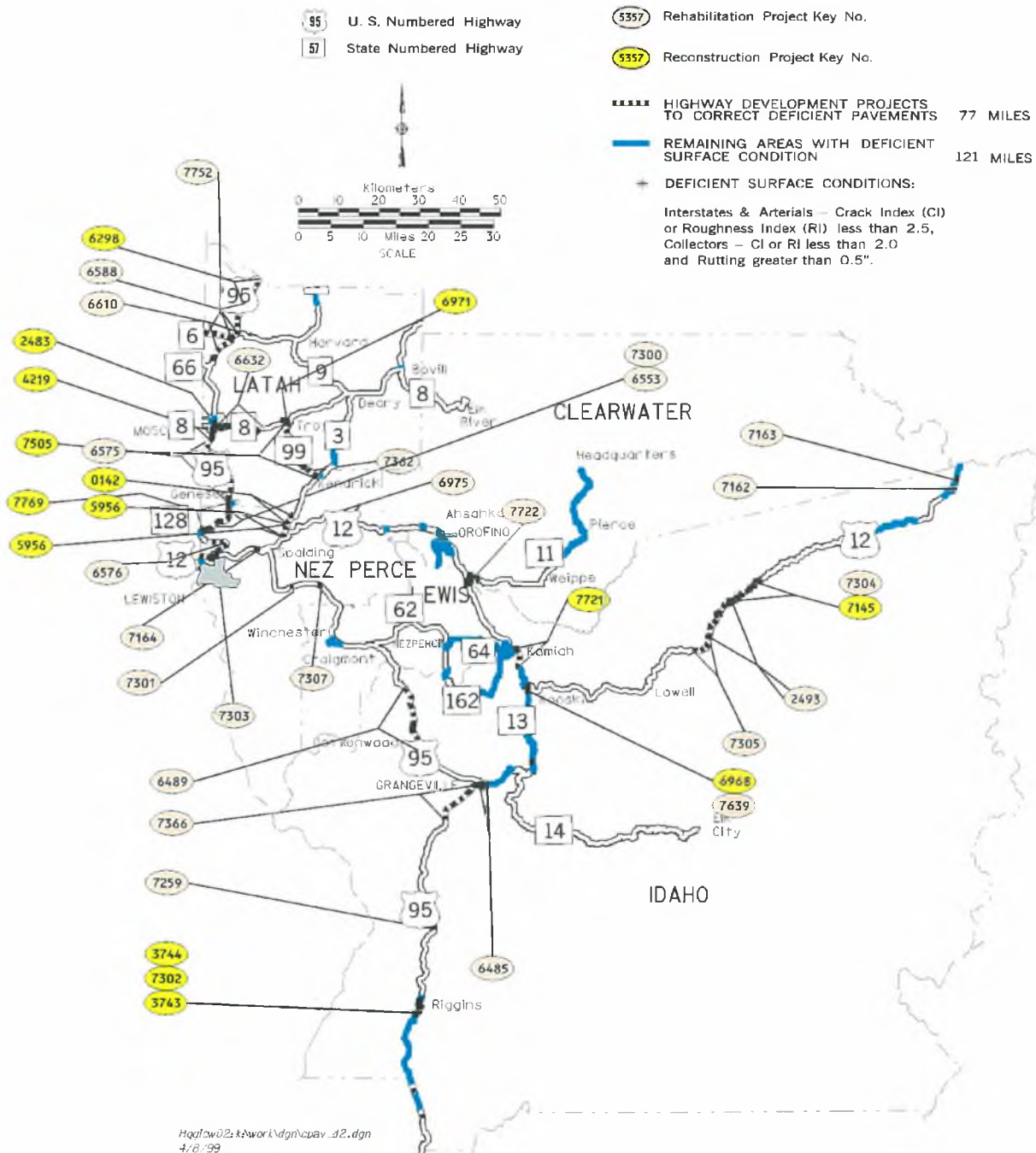
DISTRICT 2

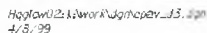
Programmed Projects vs. Pavement Deficiencies

FY 1999 – 2003



LEGEND





Page 30

DISTRICT 4 Programmed Projects vs. Pavement Deficiencies⁺ FY 1999 – 2003

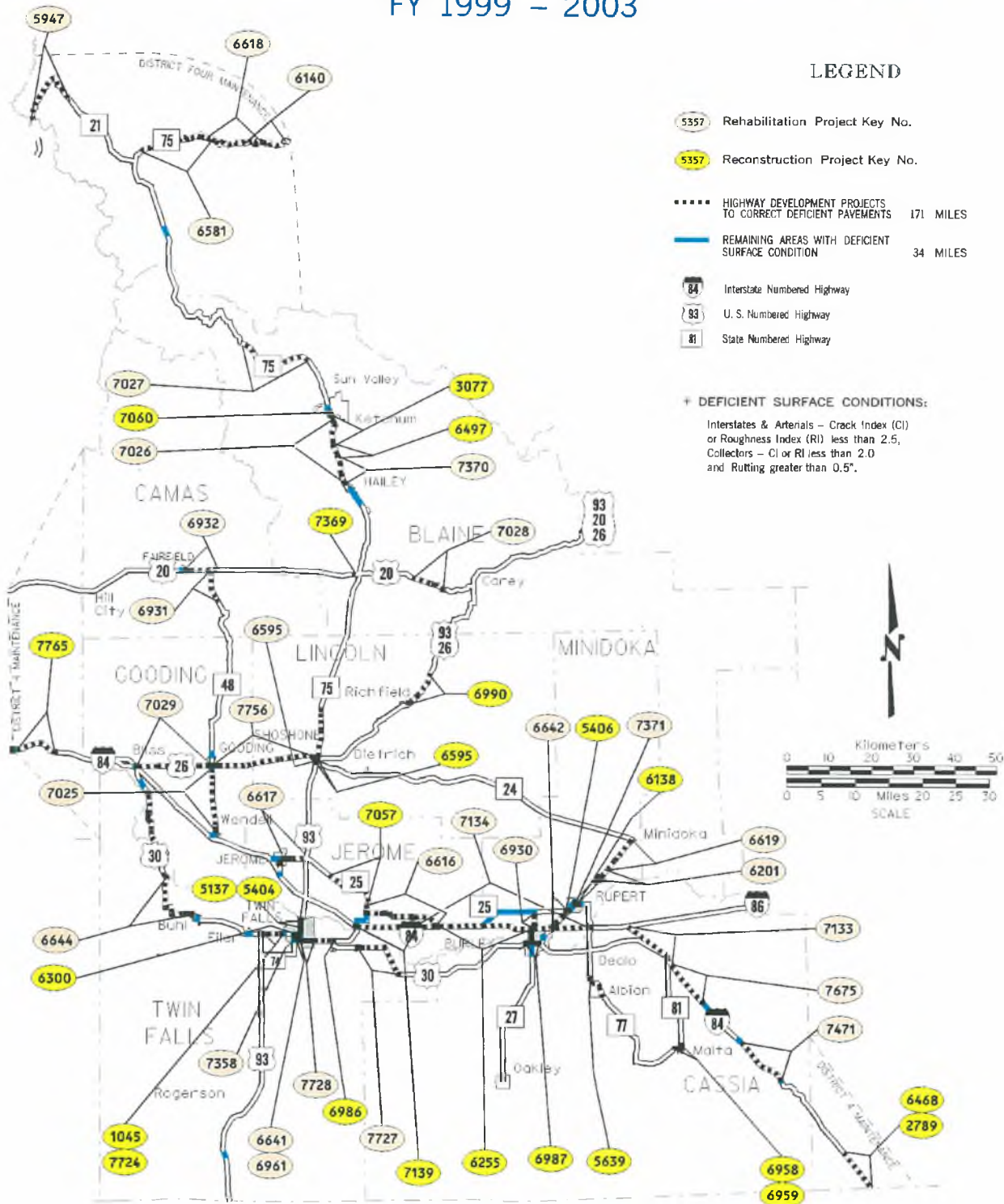


LEGEND

- 5357 Rehabilitation Project Key No.
- 5357 Reconstruction Project Key No.
- HIGHWAY DEVELOPMENT PROJECTS TO CORRECT DEFICIENT PAVEMENTS 171 MILES
- REMAINING AREAS WITH DEFICIENT SURFACE CONDITION 34 MILES
- 84 Interstate Numbered Highway
- 93 U. S. Numbered Highway
- 81 State Numbered Highway

+ DEFICIENT SURFACE CONDITIONS:

Interstates & Arterials – Crack Index (CI) or Roughness Index (RI) less than 2.5,
Collectors – CI or RI less than 2.0
and Rutting greater than 0.5".



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Map 12.

DISTRICT 5

Programmed Projects vs. Pavement Deficiencies

FY 1999 – 2003



LEGEND

DEFICIENT SURFACE CONDITIONS:

Interstates & Arterials – Crack Index (CI) or Roughness Index (RI) less than 2.5,
Collectors – CI or RI less than 2.0
and Rutting greater than 0.5".

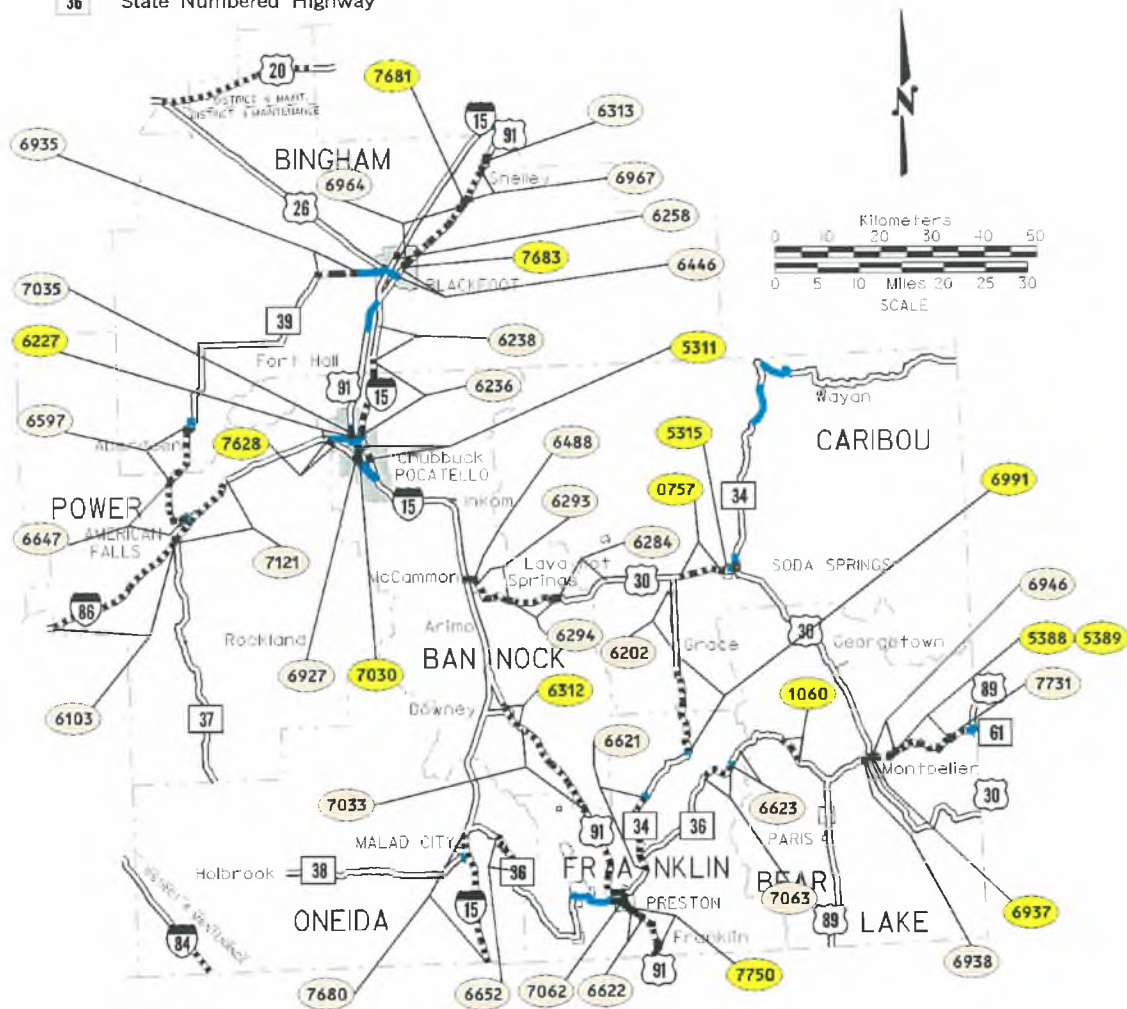
- Interstate Numbered Highway
- U. S. Numbered Highway
- State Numbered Highway

Rehabilitation Project Key No.

Reconstruction Project Key No.

HIGHWAY DEVELOPMENT PROJECTS TO CORRECT DEFICIENT PAVEMENTS 125 MILES

REMAINING AREAS WITH DEFICIENT SURFACE CONDITION 43 MILES



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Map 13.

Section 5 SEAL COATS



Seal-coat projects are designed to preserve and maintain rural Idaho highways.

Seal coats are an important part of the department's preventative-maintenance program. Preventative maintenance slows the rate of pavement deterioration which increases the service life of our highway system. Seal coats help protect our pavements by reducing damage caused by oxidation and moisture and improve skid resistance.

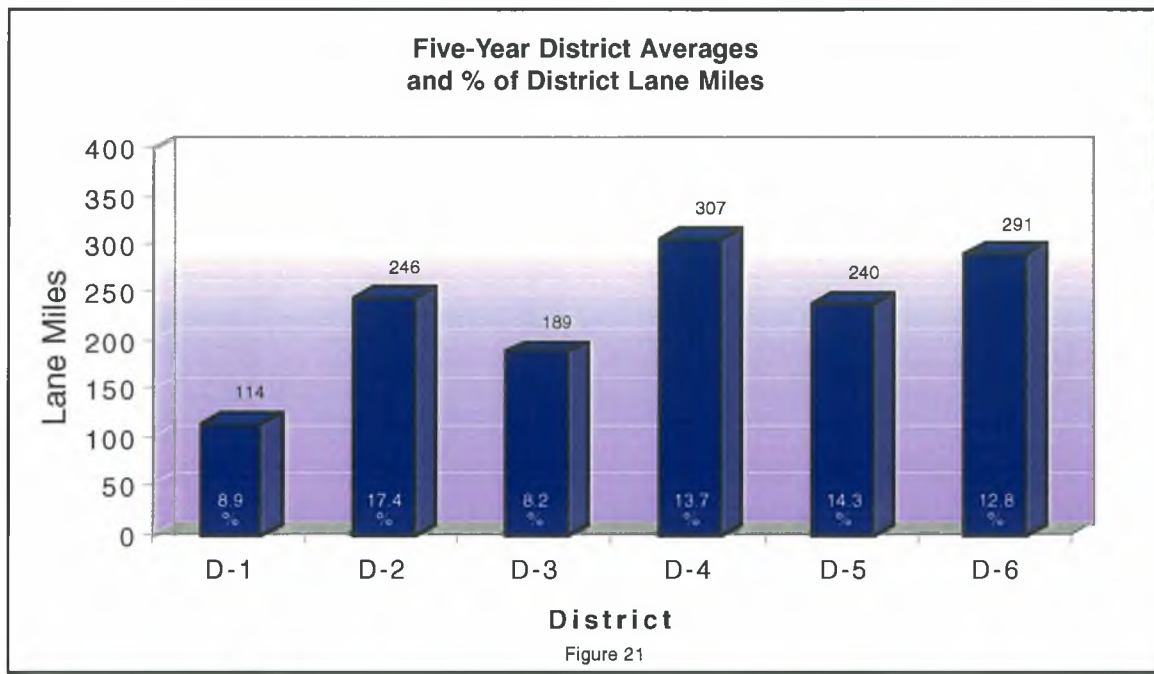
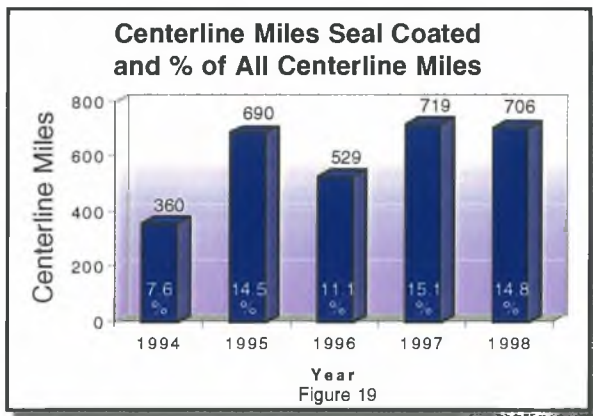
Figures 19 and 20 provide a five-year look at seal coats from a statewide perspective. Centerline and lane miles of seal-coat projects are tabulated for years 1994 through 1998.

Figure 21 shows the five-year average of lane miles seal coated and the percentage of lane miles seal coated by district.

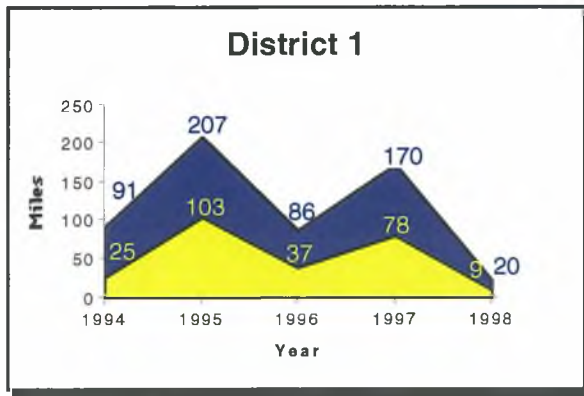
- District 2 has the highest "percentage" of lane miles seal coated annually (17.4% or 246 lane miles).
- District 4 seal coats more lane miles annually than any other district (an annual average of 307 lane miles or 13.7%).

Figures 22 through 27 show the miles seal coated from 1994 to 1998 in each of ITD's six districts.

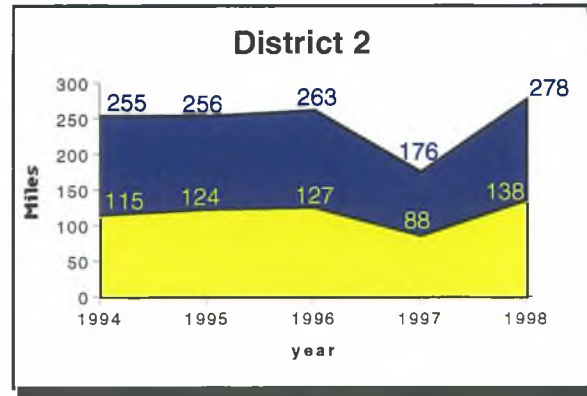
STATEWIDE FIVE-YEAR SEAL COAT HISTORY (1994 - 1998)



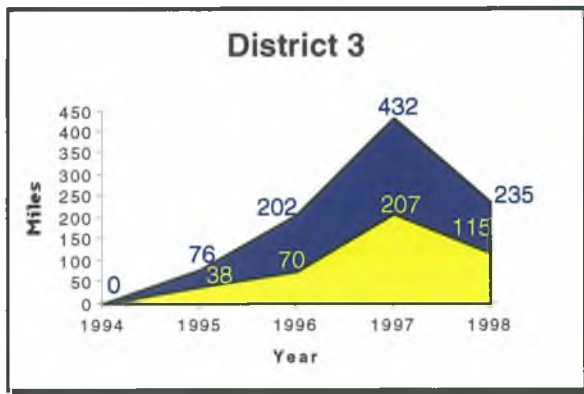
STATEWIDE FIVE-YEAR SEAL COAT HISTORY BY DISTRICT (1994 - 1998)



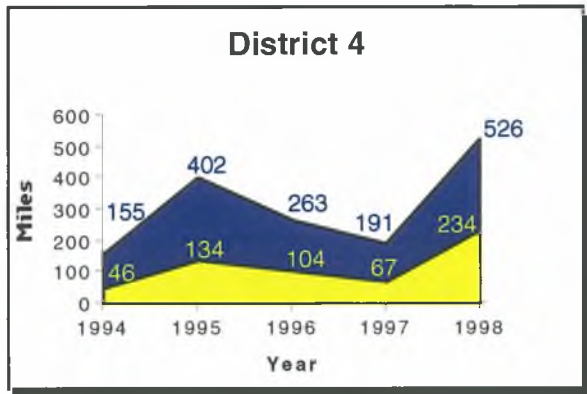
5-Year Lane Mile Average = 114



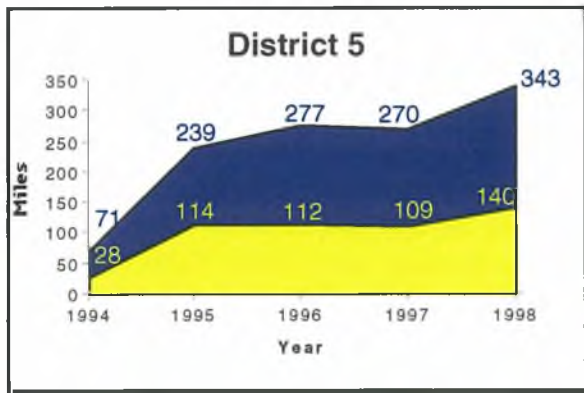
5-Year Lane Mile Average = 246



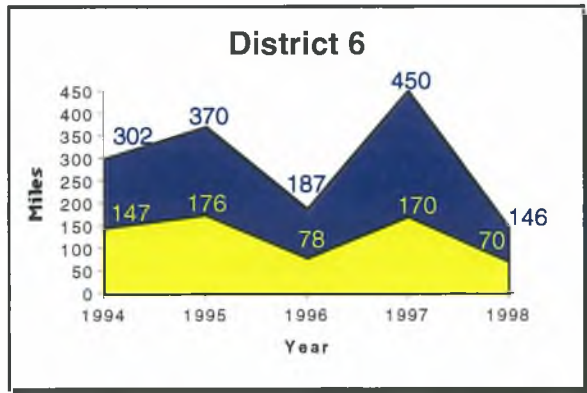
5-Year Lane Mile Average = 189



5-Year Lane Mile Average = 307



5-Year Lane Mile Average = 240



5-Year Lane Mile Average = 291

■ Lane Miles ■ Centerline Miles

Figures 22 through 27

Section 6 SUMMARY



MAINTENANCE, REHABILITATION, AND RECONSTRUCTION

Idaho is making significant progress in the reduction of pavement deficiencies on the State Highway System. Pavements that are considered deficient have declined from nearly 40% in 1993 to 19% projected for 1999.

This reduction in deficiencies can be attributed to:

- **Maintenance:** Seal coats and other activities slow the rate of deterioration. The result of a strong maintenance program is that fewer deficiencies come on the system each year.
- **Rehabilitation:** The minor rehabilitation program has reduced pavement deficiencies. Under this program, pavements are resurfaced before they deteriorate to the

point that reconstruction is necessary. The program allows us to keep our pavements in good condition.

- **Reconstruction:** When pavements have reached the end of their service life an effective reconstruction program is necessary.

Maintenance, rehabilitation, and reconstruction are all appropriate tools that need to be used at different times in the life of a pavement. It is important to select the proper tool to use at the appropriate time. Wise future project selections will allow Idaho to continue:

- Spending its limited roadway dollars wisely;
- Reducing roadway deficiencies and the rate at which roadways become deficient.

STATEWIDE PAVEMENT CONDITION PROJECTION

Condition Based on Cracking and Roughness Index

1998 - 2003

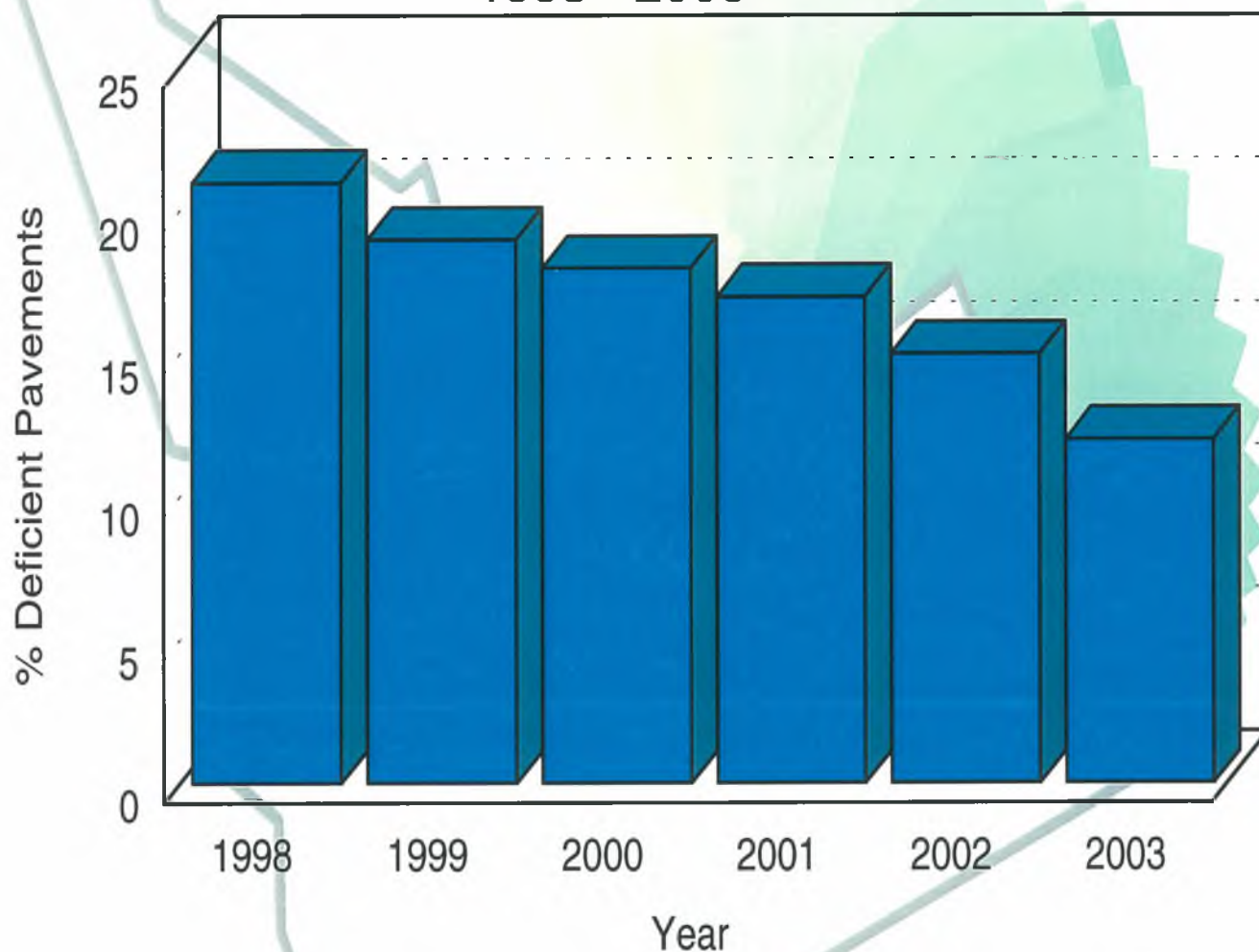
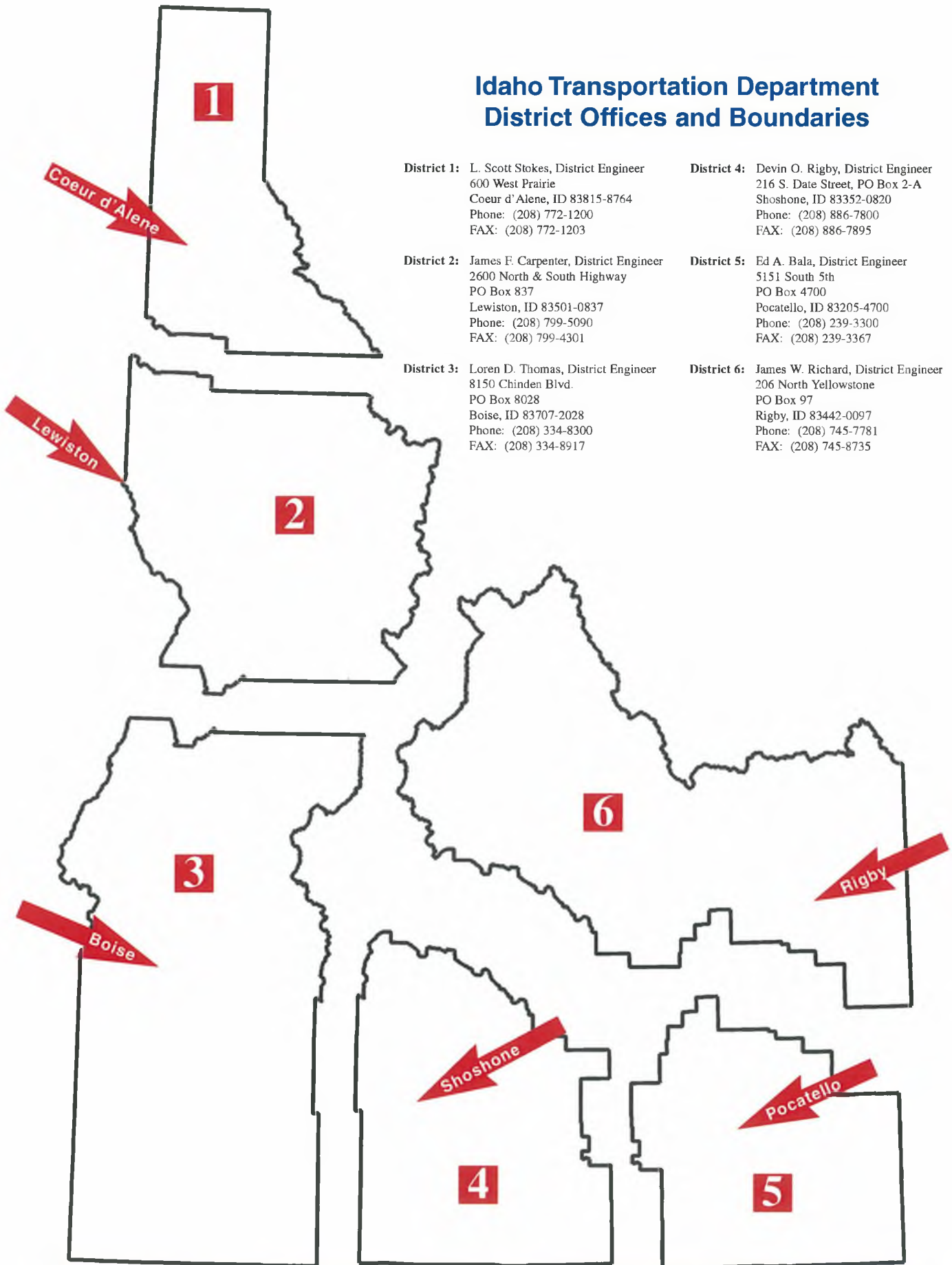


Figure 28.

Idaho Transportation Department District Offices and Boundaries





Pavement Management System